Chapter 1
Introduction to Volume 2

1.1 Overview of Volumes 1 and 2

This document is the second in a two-volume series addressing wetlands in Washington and their protection and management. The first volume, *Freshwater Wetlands in Washington State - Volume 1: A Synthesis of the Science* (Sheldon et al. 2005), is a synthesis of the most current science and was released in draft form to the public in the fall of 2003. The comments from reviewers of the draft were used to revise the document and create the final version. All of the comments received on Volume 1 and the author's responses to them, as well as a 10-page summary of the significant comments, are posted on the project's web page: http://www.ecy.wa.gov/programs/sea/bas_wetlands.

Volume 1 synthesized the literature regarding:

- Freshwater wetlands in Washington and how they function
- The effects of human activities on Washington's freshwater wetlands and their functions
- The tools used to protect and manage freshwater wetlands and their functions and values

The key conclusions from Volume 1 are summarized in Chapter 3 in this document.

Volume 2 contains guidance primarily for local governments on protecting and managing wetlands and their functions based on the synthesis of the science in Volume 1. Although the primary audience is local governments, the information contained in this document should be useful to anyone who has an interest in the protection and management of wetlands in the state.

The key themes or messages in Volume 2 are as follows:

- By relying on a site-by-site approach to managing wetlands, we are failing to effectively protect them
- To effectively protect wetlands and their functions, we must understand and manage their interaction with the environmental factors that control wetland functions
- To understand and manage these environmental factors and wetland functions, information generated through landscape analysis is needed

- Landscape analysis should be one step in a four-step framework that should be used in developing a diversified program to protect and manage wetlands and their functions; the four-step framework should include analyzing the landscape, prescribing solutions, taking actions, and monitoring results and applying adaptive management

- Protection and management measures developed and implemented in steps two and three of the four-step framework (prescribing solutions and taking action) should incorporate a full range of components including:

  – Policies and plans such as landscape-based plans (such as Green Infrastructure), comprehensive plans, subarea plans, etc.

  – Regulations such as critical areas ordinances, clearing and grading ordinances, etc.

  – Non-regulatory activities such as incentives that encourage conservation, restoration, and preservation through voluntary efforts

1.2 Purpose and Goals of Volume 2

Both Volumes 1 and 2 were written to assist local governments in complying with requirements in the Growth Management Act (GMA) to include the best available science when adopting development regulations to designate and protect critical areas, including wetlands. The GMA requires that local governments protect wetland functions and values, and evaluate and include relevant scientific information when determining what policies, plans, and regulations are needed. (See Chapter 2 for a discussion of the relevant mandates in the Growth Management Act.)

This is a challenging task and one that some cities and counties are poorly equipped to undertake. Many local governments have asked the state departments of Ecology and Fish and Wildlife to assist them by synthesizing the science (Volume 1) and providing general guidance as well as specific recommendations for protecting wetlands based on the science (Volume 2). (See Section 1.4 on how Volume 2 was developed.)

The guidance presented in Volume 2 is advisory only. Local governments are not required to use this guidance. The guidance in and of itself is not "best available science." Rather, it represents the recommendations of the departments of Ecology and Fish and Wildlife as to how a local government could include the best available science in policies, plans, and regulations to protect wetlands.

Volume 2 was also written to address the fact that wetlands continue to be lost and degraded through human activities in spite of the adoption of "no net loss" policies at local, state, and federal levels and an increased knowledge of the complex processes that drive wetland functions. The results of the scientific research synthesized in Volume 1 are clear: We have not stopped the continued degradation of our wetlands and their functions (Sheldon et al. 2005).

As concluded in Volume 1, wetland losses often result from a combination of impacts from human activities that occur both within and outside individual wetlands. Changes from human activities result in cumulative impacts across the landscape. Currently, however, the majority of decisions about managing wetlands in Washington State fail to consider environmental factors that control wetland functions or the consequences of human actions that occur at a landscape scale; they are made on a case-by-case basis related to specific projects.

The departments' goals for Volume 2, therefore, are to help local governments:

- Include current scientific information in their decisions about the protection and management of wetlands to meet the requirements of the GMA
- Incorporate a diversified, landscape-based approach to better protect wetlands and their functions and values and to manage cumulative effects

Where possible, the authors of Volume 2 provide several options for protecting and managing wetlands using landscape analysis, processes for planning, regulatory options, as well as non-regulatory approaches. For example, three alternatives for buffer widths are presented, one being a matrix using factors such as wetland rating, intensity of the proposed, adjacent land use, wetland functions, and other characteristics. Such approaches allow more flexibility.

In the future, it is hoped that:

- The protection and management of wetlands will be integrated with the management of all environmental resources across the landscape
- Impacts to wetland functions and values from decisions about land uses will be understood at the appropriate geographic scales
- Local jurisdictions will plan for future development in a proactive manner, so impacts to the environmental factors that control functions are minimized before they occur
- When tradeoffs between conflicting values are made, the decision will be made with a full understanding of the "true value" lost or gained

1.2.1 Implementing a More Comprehensive Approach

This volume presents a four-step framework that integrates scientific information about the landscape (landscape analysis), planning approaches, and regulatory and non-

regulatory actions at the different geographic scales at which natural resources should be managed. It represents the ideal situation where a local government has adequate resources and commitment to undertake this process. The available scientific information makes clear that the most effective way to protect wetland functions and values is to use a comprehensive, landscape-based approach. Addressing only some of the recommendations in this volume, therefore, increases the risk that wetland functions and values will not be adequately protected. (See Chapter 10 for additional discussion of characterizing the risk of proposed solutions for protecting and managing wetlands.)

The departments of Ecology and Fish and Wildlife understand that not all local governments are currently in a position to implement the diversified, comprehensive program described in Volume 2. The entire process is presented so users can understand what information or tasks they are missing and to help understand the tradeoffs being made and the risks taken.

The authors of Volume 2 also recognize that many jurisdictions will face a challenge in updating their development regulations to meet the state GMA deadlines, even without incorporating a landscape perspective at this time. In addition, transforming our approach to managing wetlands from a site-specific focus to a view of the broader landscape is a change of practice for local governments. It will most likely occur incrementally as local governments collect and analyze landscape data and incorporate that information into their various policies, plans, and regulatory and non-regulatory activities. Local governments, therefore, should at a minimum adopt strong wetland regulations until they can incorporate landscape-based plans, policies, and non-regulatory elements.

Working with local governments on developing and using landscape analysis

This document provides ideas on how to analyze the landscape as well as references for the various analyses that are available (see Chapter 5 and Appendix 5-B). One method for landscape analysis that is described is a method currently being developed by Ecology. It provides suggestions on how to analyze landscape information (such as geology, soils, and water flow) for use in planning, developing protection measures, and identifying wetlands for restoration and preservation.

Ecology's method for landscape analysis is being improved as it is applied in different jurisdictions. In addition, the methods are currently lacking an analysis of wildlife habitat and corridors. This gap will be addressed in the near future as the departments of Fish and Wildlife and Ecology work together to better include wildlife factors in the analysis.

Ecology invites local governments to work with the agency to conduct landscape analyses and use the information to develop more effective approaches to protecting and managing the landscape and its wetlands. In this way, local governments can play an important role in further developing this approach to landscape analysis.

1.3 Scope of Volume 2

1.3.1 Non-GMA Protection of Wetlands is Not Addressed in Volume 2

The regulations and management programs implemented by federal, state, and tribal governments are not discussed in Volume 2. For example, the Clean Water Act administered by the U.S. Army Corps of Engineers is not discussed. These laws are only mentioned in relation to direct mandates to local governments. For example, the definition of wetlands used by local governments is mandated in state statute (see Chapter 8).

There is, however, a brief discussion of the Shoreline Management Act (SMA). In Chapter 4, the SMA is mentioned in relation to the four-step framework recommended in this volume for local wetland protection programs. The SMA guidelines include requirements for the inventory and analysis of "ecosystem-wide processes" (landscape processes). These requirements are consistent with the recommendations in Volume 2 for incorporating landscape analysis into local planning and protection efforts. The reader is referred to the following web site more information on the SMA guidelines (http://www.ecy.wa.gov/programs/sea/SMA/index.html).

1.3.2 Vegetated Tidal Wetlands are Addressed in Volume 2

The recommendations made in this document are not strictly limited to freshwater wetlands. Vegetated tidal wetlands (a subset of all tidal wetlands including vegetated wetlands in estuaries and coastal lagoons) are addressed specifically in the revised wetland rating system for western Washington (Hruby 2004b) because they were included in past versions of the rating system, even though the scientific information about them was not summarized in Volume 1. The scientific information on which recommendations for tidal wetlands were based is summarized in Appendices 8-E and F.

1.3.3 How Values are Addressed in Volume 2

As discussed in Volume 1, wetland functions are the things that wetlands "do." Society, however, does not necessarily attach "value" to all wetland functions. Value is usually associated with goods and services that society recognizes. For example, trapping sediments is a wetland function that improves water quality, and this is often valued by society. Not all of the environmental factors that control wetland functions or the functions themselves, however, are recognized or valued.

Sometimes what is valued is not what a wetland does but some other aspect of the wetland ecosystem that is considered important socially. For example, "recreation" is valued by society and is often called a function even though it is not something a wetland "does." Other aspects of the wetland ecosystem that are valued and have been called

functions include "education" and "aesthetic quality." These values are sometimes referred to as *social functions* to separate them from functions based on environmental factors.

The social functions cannot be assessed or rated using the same methods used to assess functions based on environmental factors. Valuing social functions requires methods based on economic, sociologic, and psychological tools, rather than on ecology and other environmental sciences. Therefore the literature on social functions was not synthesized in Volume 1.

The values of a community are an important consideration when developing the plans and polices of local governments. Values in this context are opinions held by communities in regard to what is important to them. For example, a community (urban or rural) might value one wetland function more than another. Water quality improvement might be more valued than flood control in an area with water quality problems if that community is not in an area prone to flooding. In addition, a community might value certain amenities in their neighborhoods or rural areas above others. For example, a neighborhood might value keeping the maximum amount of vegetated area through clustered development as opposed to scattered development that results in fragmented islands of vegetation. The need to identify and consider these values is discussed in Chapters 6 and 7. The landscape analysis discussed in Chapter 5 provides important information needed when making decisions about a community's values as well as what communities, and their wetlands, will be like in the future.

1.4 Developing Volume 2

Production of this document and Volume 1 was funded through a grant from the U.S. Environmental Protection Agency. Attendees of two focus groups provided early direction for the volumes. Meetings of focus groups were held in Olympia and Moses Lake in early 2002 to solicit ideas for the scope and objectives of the project. This information was used to guide the development of both volumes. These focus groups were attended by over 60 individuals, primarily representatives from local governments and consulting firms.

Both volumes were developed by a team (called the Core Team). Membership of the Core Team changed somewhat with the initiation of Volume 2. The Core team for Volume 2 consisted of staff from the departments of Ecology, Fish and Wildlife, and Community, Trade and Economic Development; Sheldon & Associates; and 2N Publications (the contract editor for the draft). A list of the members of the Core Team for Volume 2 is provided in Appendix 1-A. Several members of the Core Team wrote the various sections, chapters, and appendices of Volume 2.

The Core Team developed the guidance in conjunction with a team of local government staff: a Local Government Wetlands Advisory Team (LGWAT). The LGWAT members are also listed in Appendix 1-A. The LGWAT convened in December 2003 to provide ongoing input and guidance during the development of this volume. The team met

several times to review and respond to draft concepts and materials developed by the Core Team. Additionally, meetings were held with representatives from the business and environmental communities to solicit their ideas and comments on concepts and early draft documents (see Appendix 1-B).

The draft of Volume 2 was distributed for review during a four-week period to solicit comments. It was provided to all those who requested a hard copy, or a CD, or who downloaded it from the project's web page. Prior to the completion of the draft, a newsletter was sent to the project's mailing list of over 1,200 recipients, informing them of the review period. They were requested to inform Ecology if they wanted to review the draft and in what form they wanted to receive it. The Core Team requested that reviewers critique the general guidance as well as specific recommendations or additions. Comments regarding organization and ease of reading were also welcomed.

Seven reviewers provided comments (see Appendix 1-B) which were reviewed by the authors and were compiled in a separate document along with the author's responses to the comments. All four documents (responses to comments on the draft of Volume 1, the final version of Volume 1, responses to comments on the draft of Volume 2, and the final version of Volume 2) are posted on the project's web page and can be obtained as a CD or paper copy (http://www.ecy.wa.gov/programs/sea/bas_wetlands).

1.5 How Volume 2 is Organized

Volume 2 is organized into 12 chapters plus references, a glossary, and appendices. The first three chapters in this document explain the purpose, legal basis, and basic scientific foundation for the recommendations that follow. Chapter 4 outlines a suggested framework (divided in to four steps) which local governments can use to develop a diversified program to protect and manage wetlands. The remaining chapters, Chapters 5-12, describe the four steps and the primary components of a wetland protection program. The chapters include discussions of analyzing the landscape, landscape-based plans, comprehensive plans, regulatory and non-regulatory tools, characterizing the risk of wetland protection, implementing components of a protection program, and monitoring and adaptive management. Methods for analyzing landscapes and wetlands, recommended language for an ordinance, and various supporting information are provided in the appendices.

1.6 How to Use Volume 2

Local governments are encouraged to read and understand the entire document before determining how they want to protect wetland functions and values. This document is not intended to be a scientific treatise and, in general, references to specific scientific literature are limited. While Chapter 3 provides an overview of the scientific basis for the recommendations in this document, the more detailed, peer-reviewed and referenced information on wetland science is contained in Volume 1. We highly recommend reading Volume 1 as well, especially key points and conclusions.

As noted above, many of the recommendations in this document cannot be tied to a specific scientific article and cannot be cited as such (or the list of citations would be extremely long and cumbersome). Citations are provided only when a specific recommendation was also made within the scientific literature. Additional literature sources are cited in Chapters 6, 7, 9 and elsewhere in various parts of Volume 2. Many of these are more oriented towards policy and are not strictly scientific in nature. They were not, therefore, included in the synthesis of the science in Volume 1. Lastly, references are provided in various appendices. These are not necessarily included in the list of cited references but are at the end of the individual appendix in which they are mentioned.

In Volume 2, measurements are given in English Customary instead of metrics, whereas in Volume 1 both metric and standard are provided. For example, buffer widths are listed in feet only, not feet and meters. This was chosen because most local governments use English Customary measurements in their plans and regulations.

As mentioned previously, the guidance provided in Volume 2 is advisory only. The Growth Management Act <u>does not</u> require that local governments adopt the protection measures recommended in this document. Local governments are free to use or adapt the four-step framework and the options and recommendations presented here or develop entirely different approaches to protecting wetlands to fit their particular circumstances.

1.7 Using Science to Protect and Manage Wetlands

We recognize that it is challenging for local governments to include the best available science in developing or updating measures to protect and manage wetlands. In the following sections we discuss several topics relevant to this challenge. The topics include ecological principles to use when considering options for protecting and managing wetlands, some reasons why including the science can be challenging, and understanding the risks of the decisions made.

"To be effective, the nation's wetlands protection and management programs must anticipate rather than react. They should focus on future, not the present or the past; on effectively protecting the remaining resources and actively restoring or creating additional wetlands. They should anticipate needs and problems on the basis of rigorous analyses of regional resources, trends, stresses, and values. They should consider the whole, not just the individual parts."

The Conservation Foundation, *Protecting America's Wetlands: An Action Agenda. The Final Report of the National Wetlands Policy Forum* (1988).

1.7.1 Ecological Principles to Consider

The Ecological Society of America has taken a lead in compiling and explaining scientific principles on managing natural resources, such as wetlands (Dale et al. 2000). The ecologist's goal is to ensure that future decisions include the best scientific information available. The principles illustrate the need to take a more holistic, landscape approach to managing our natural resources. The principles and their implications in environmental decision making are briefly summarized in Table 1-1.

Table 1-1. Ecological principles and their implications in making decisions about land use (adapted from Dale et al. 2000 to focus on wetlands rather than land use in general).

Ecological Principle	Implication for Managing Land Use in and Around Wetlands
The type, intensity, and duration of disturbances are the major factors shaping populations and the ecosystem as a whole. Disturbances can occur at many different spatial and temporal scales.	Changes in land use that cause new disturbances are likely to cause changes in animal and plant populations and the functions of a wetland. We need to manage disturbances at the scale at which they occur. For example, the eutrophication of a wetland may be a result of disturbances throughout its watershed and this problem cannot be managed only within the wetland itself. Also, it is not possible to target a specific "end point" when creating or restoring wetlands because changes are continuous.
Ecological processes operate at many time scales, and ecosystems change through time.	The current state of a wetland is in part a consequence of historical conditions. Therefore, historical information may be needed to understand how a wetland will respond to disturbance. Managing wetlands to protect their valuable functions requires us to consider how ecological processes change through time both with and without the influence of human activities.
Some species have key, broad-scale effects on the ecosystem (keystone species).	The removal of keystone species can radically change the functions in a wetland and spread well beyond the boundaries of the wetland. Because the effects of keystone species are complicated and not fully understood, we cannot predict the effects on the ecosystem of changes in their numbers or distribution. For example, removing beavers from a river system has significant impacts on the biological diversity and flooding patterns of the entire watershed.
Local conditions strongly affect environmental functions at a site.	The position of a wetland in the landscape defines the functions it performs. Wetlands in a specific landscape position may perform only certain functions and at specific rates. We need to understand these local conditions when creating, restoring or enhancing wetlands so we do not "plan" for functions that the landscape will not support. For example, wetlands on slopes do not pond water. Creating a ponded wetland on a slope is not compatible with the position in the landscape, and maintaining this wetland will require constant management of the dikes and the outflow structure.
The size, shape, and location of different types of uplands around a wetland influence its functions.	An understanding of the surrounding landscape is needed to understand the implications of decisions made about an individual wetland.

The Ecological Society of America has also proposed guidelines for managers to use in considering the ecological impacts of their decisions about land use (including wetlands) (Dale et al. 2000). These guidelines, listed below, can be considered a checklist of factors to consider when making decisions about protecting or managing wetlands:

- Examine the impacts of local decisions in a regional (or landscape) context
- Plan for long-term change and unexpected events
- Preserve rare landscape elements, critical habitats, and associated species
- Avoid land uses that deplete natural resources over a broad area
- Retain large contiguous or connected areas that contain critical habitats
- Minimize the introduction and spread of non-native species
- Avoid or compensate for the effects of development on ecological processes
- Implement land use and land management practices that are compatible with the natural potential of the area

1.7.2 Interpreting the Science

Decisions by hearings boards and the courts have made clear that the requirement to "include the best available science in developing policies and development regulations to protect the functions and values of critical areas" is a substantive requirement, not merely a procedural one. (A review of hearings board and court cases that summarizes the key findings related to best available science, prepared by staff from the Department of Community, Trade and Economic Development and the state Attorney General's office, is presented in Chapter 2.)

However, incorporating scientific information in policies, plans, and regulations is challenging. The science of projecting how future land uses influence aquatic resources, such as wetlands, is still in its infancy (Nilsson et al. 2003). Planners using the scientific information available should not expect to be able to employ detailed methods that provide quantitative assessments of impacts from future development. Using existing data and tools, the ecological forecasts are largely qualitative in nature and essentially based on expert knowledge and correlations (Nilsson et al. 2003). Thus, the results of applying scientific principles are presented in terms of a "high," "moderate," or "low" risk to natural resources rather than a quantitative estimate of impacts (e.g., the number of amphibian species will be reduced by 50% if the county permits the filling of 10% of the remaining wetlands).

In fact, one of the greatest difficulties in applying scientific information in land-use planning and management is that the "science" doesn't provide specific answers for each circumstance that arises. The scientific information available rarely supplies us with exact or precise solutions for local circumstances. For example, some experiments that could be used to estimate the loss of amphibian species may not be applicable outside the immediate geographic area where the experiments were performed.

Furthermore, the scientists who reviewed the literature for Volume 1 found few studies that actually documented the effectiveness of specific protection measures (see Chapters 5 and 6 in Volume 1). Rather, most studies discuss the impacts of human activities on wetlands in general. The results are presented as correlations. For example, a decline in amphibian species in the Stockholm Sweden area has been correlated with the amount of developed land in the immediate vicinity of wetlands (Lofvenhaft 2002). This type of study does not demonstrate a true cause-and-effect relationship. There is no experimental proof that the decline is caused by the change in land use. Many impacts of human activities are not well understood and can only be hypothesized based on correlations.

As a result, recommendations based on scientific information are, to a large degree, based on hypotheses that extrapolate and synthesize all the information collected. Many of the recommendations in this document represent the collective interpretations by the authors (as reviewed by the Department of Fish and Wildlife) of the findings of the scientific literature synthesized in Volume 1 and how it pertains specifically to Washington or specific geographic regions within the state.

For example, the recommendation that a 200-foot buffer will adequately protect the wildlife habitat functions of high-functioning wetlands in eastern Washington is not based on one specific scientific study. Rather, it represents a synthesis of many studies (see Chapter 5 in Volume 1). These studies show that different species need different widths of buffers that range from 100 feet to more than 600 feet. Furthermore, very few studies have focused specifically on the needs of wildlife in wetlands of eastern Washington. Therefore, to provide general guidance, the authors were forced to make an informed decision on the size of buffer needed to protect wildlife in the wetlands of eastern Washington. In the absence of information about the species actually using a wetland, it was judged that a 200-foot buffer would adequately protect wildlife in wetlands that provide good habitat and are well connected in the landscape with a moderate risk that the protection standard will result in some degradation or loss of function. A local jurisdiction that wants to take a low-risk approach would increase the buffer widths above what is recommended in this volume.

1.8 Science and Risk Management

One of the major recommendations made in Volume 2 is that local jurisdictions should understand the risk to the wetland resource resulting from their decisions. The uncertainties of translating the science to specific protection measures, described above, is one of the reasons that local governments need to assess the risks. Using buffers again as an example, one might ask: *How wide a buffer is enough to protect wetland functions?* The science does not say that a 100-foot buffer will protect a certain kind of wetland, whereas a 95-foot buffer will not. Instead, scientific information on buffers clearly states that buffers are important, that they perform many functions that are critical to maintaining wetland functions, and that a wide range of buffer widths provides a variety of benefits depending on a number of factors.

Therefore, answering the critical question *How wide a buffer is enough?* is largely an exercise in assessing the science and deciding how much risk is acceptable. A regulation that sets a 300-foot buffer around every wetland significantly reduces the risk to those wetlands from human activities in the immediate vicinity of the wetland. That regulation can be characterized as relatively "low risk." On the other hand, a jurisdiction that decides they will provide a 50-foot buffer for all wetlands would have to characterize their action as "high risk" because a 50-foot buffer will not protect many wetland functions.

In this document, risk is addressed by tailoring the degree of protection to several factors that the scientific literature says are important. Continuing to use buffers as an example, one option presented in Volume 2 provides different buffer widths depending on the type of wetland and the functions it performs, as well as the type and intensity of adjacent land use. The widths recommended in this volume were selected from the middle of the range of buffers suggested in the literature: This, therefore, represents a moderate risk approach to determining buffer widths.

"Characterizing the risk" of decisions is also an important tool for improving approaches to wetland protection. Scientific data on the effectiveness of measures for protection can be collected and used to monitor the success of wetland management. This information then provides an objective basis on which to revise management approaches. (Risk characterization is discussed in detail in Chapter 10, and Chapter 12 provides information on monitoring and adaptive management.)

Many local governments will be inclined to rely largely on a regulatory approach to protect wetlands, and will tend to skip over the guidance on using a landscape approach as well as recommendations regarding landscape-based plans and non-regulatory tools. However, we believe the key message from the scientific literature is that reliance upon a strictly regulatory, permitting approach will fail to adequately protect wetland functions and values. Decision-makers should, therefore, consider the entire context of wetland protection and management when choosing the protections afforded to wetlands — from reducing impacts to wetlands through planning and zoning based on landscape analysis to using non-regulatory approaches such as stewardship incentives and restoration programs.